Attorney Docket No. 47753.C2/ C-3520.0

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#11
TL 11/22/02
1 of 3

Applicant:	Ted TSAI
Application No.:	09/609,513
Filing Date:	July 3, 2000
Confirmation No.:	1686
Title:	MINIMIZING CHLORINATED ORGANICS IN PULP BLEACHING PROCESSES
Examiner:	M. Alvo
Group Art Unit:	1731

APPEAL BRIEF

BOX BPAI
Appeal Board of Patent
Appeals and Interferences
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to 37 C.F.R. §1.191 and §1.192(c), Appellants hereby submit this their Brief on Appeal from the Examiner's Final Rejection of March 1, 2002, of all pending claims in the application (Claims 1-7, 10, 11, 13-17, 19-26, 29-37, 39-42, and 44-48). This Brief is submitted in triplicate in the arrangement specified by 37 C.F.R. § 1.192, and the requisite fee of $320.00 is attached. Any underpayment should be taken from or any overage credited to Deposit Account No. 12-2355.

I. Real Party in Interest

The real party in interest to the outcome of the subject application is International Paper Company of Purchase, New York, who is the assignee of all the interest of the inventor, Ted Y. Tsai.[1]

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[1] The assignment is of record at Reel/Frame No. 7929/0133 recorded in the Patent Office on March 19, 1996.

II. Related Appeals and Interferences

No other appeals or interferences are known to Appellants, Appellants' legal representatives, or Appellants' Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

III. Status of Claims

On June 3, 2002, Appellants took this appeal from the final rejection of Claims 1-7, 10, 11, 13-17, 19-26, 29-37, 39-42, and 44-48 (all of the pending claims) of the above-identified patent application. In accordance with 37 CFR § 1.192(c)(7), the claims involved in this appeal are set forth in the attached appendix.

IV. Status of Amendments

The originally filed claims in this case were amended by a Preliminary Amendment filed September 29, 2000. No further amendments to the claims have been proposed or submitted subsequent to this Preliminary Amendment. Thus the claims currently read as amended by Appellant's Preliminary Amendment of September 29, 2000.

V. Summary of the Invention

Appellant's invention relates to a novel process for the bleaching of a papermaking pulp so as to improve the brightness and other properties of the resultant paperweb. According to the invention, the pulp is initially treated in a chlorine-containing bleaching stage such as a chlorine dioxide bleaching stage (a "D" stage), an elemental chlorine (a "C" stage) or a stage employing a mixture of chlorine dioxide and elemental chlorine (a "C/D" stage).

Thereafter, the pulp is preferably treated in a bleaching stage such as an alkaline extraction stage (an "E" stage) wherein a portion of the pulp lignins[2] are solubilized

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[2]In very brief and general terms, wood pulps used for papermaking consist of two primary components: lignins and celluloses. In preparing a pulp for papermaking it is desired to remove as much lignin from the pulp as possible while limiting the loss of celluloses, and the accompanying loss of pulp viscosity, as much as possible.

and removed after having first been halogenated in the first chlorine-containing stage of the process. The extraction stage may be fortified, in certain embodiments, by the addition of oxygen and / or peroxide to the alkaline extraction solution.

The next bleaching stage in the bleaching sequence again employs chlorine dioxide to further bleach the pulp. After this chlorine dioxide stage, the pulp then enters the last bleaching stage which is a peroxide bleaching stage (a "P" stage).

Importantly, the pulp is also treated with a metal chelating agent prior to the final peroxide bleaching stage, either during the immediately preceding chlorine dioxide stage or during an optional wash of the pulp carried out in between the chlorine dioxide stage and the final peroxide stage. The chelating agent is preferably an aminopolycarboxylic acid or an aminopolyphosphonic acid or an alkaline metal salt thereof and is added at an acidic pH of from about 1 to about 6. More preferably, the pH ranges from about 3 to about 6.

Specific examples of preferred chelating agents include ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), nitrilotriacetic acid (NTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepenta (methylenephosphonic) acid (DTPMA) and the alkali or alkaline earth salts thereof.

In certain embodiments, the chelating agent may also be added during the initial chlorine containing stage; however, this is not considered essential to the invention in its broadest forms.

Thus, the invention encompasses bleaching sequences such as $D_OE_{O+P}D_1P$, $D_OE_PD_1P$ and $D_O/C\ E_PD_1P$ with an optional washing step between the D_1 and P stages of each wherein a chelating agent is added during the D_1 stage and/or during the optional wash between the D_1 and P stages.

These bleaching sequences, which are novel and unsuggested by the art, have been found to provide significant improvement in both the brightness and viscosity of the resultant bleached pulp as compared to treatment of the pulp in the same sequence but in absence of any chelating agent.

VI. Issues

The issues presented herein for review are as follows:

1. Whether the Examiner has demonstrated that the subject matter of Claims 1 - 7, 10, 11, 13 - 17, 19 - 26, 31, 32, 36, 37, 39 - 42, 44 and 46 would have been considered obvious to a person of ordinary skill in the art over European Patent Application EP 622,491 ("EP 622,491") in view of the publication "Optimal Use of Hydrogen Peroxide to Design Low AOX ECF Sequences" by Devenyns et al. ("Devenyns"), or U.S. Patent No. 4,568,420 to Nonni ("Nonni") or the publication "Integration of D and EDTA Stages During Hardwood and Softwood Pulp Bleaching" by Sergeyev et al. ("Sergeyev") "with or without" the textbook "The Bleaching of Pulp" by Singh ("Singh")?

2. Whether the Examiner has demonstrated that the subject matter of Claim 48 would have been considered obvious to a person of ordinary skill in the art over EP 622,491 in view of Devenyns or Nonni with or without Singh and in further view of U.S. Patent No. 4,946,556 to Prough ("Prough")?

3. Whether the Examiner has demonstrated that the subject matter of Claims 30, 33 - 35, 45, and 47 would have been considered obvious to a person of ordinary skill in the art over EP 622,491 in view of Devenyns or Nonni with or without Singh and in further view of PCT International Application WO 95/27100 ("WO 95/27100")?

VII. Grouping of Claims

The independent claims currently pending are Claims 1, 19, 36, and 46.

Claim 1 is directed to a method for bleaching a digested kraft pulp in which the pulp is treated in a first chlorine dioxide-containing stage and subsequently in a second chlorine dioxide bleaching stage which is carried out at a pH of from about 1 to about 6. The next stage after the second chlorine dioxide stage, and the final stage of the method, is a peroxide bleaching stage. Importantly, a chelating agent is added to the pulp during the second chlorine dioxide stage. The pulp so treated exhibits a substantial improvement in viscosity retention and brightness.

The remaining independent claims are similar being somewhat broader in certain respects but narrower in others. For instance, according to Claim 19, the first

bleaching stage need only include a chlorine-containing compound, not necessarily chlorine dioxide. Following this initial stage, Claim 19 specifies an extraction stage containing oxygen and/ or peroxide which is not required by Claim 1. Regarding the chelating agent, Claim 19 specifies that the chelating agent is from about 0.01 wt. % to about 1 wt.% of the dry weight of the pulp fibers and may either be added during the chlorine dioxide stage or during an optional wash immediately after such stage.

Claim 36 differs from the aforementioned claims in specifying a pulp consistency of from about 0.5% to about 40% and recites a four stage bleaching process wherein the first stage is a chlorine dioxide stage, the second an extraction stage with oxygen and / or peroxide, the third an additional chlorine dioxide stage, and the fourth a peroxide bleaching stage. Claim 36 also requires that the chelating agent is in an amount sufficient to substantially reduce an organic halide content of the bleached pulp and the chlorine dioxide / chelating treatment is carried out at a temperature of from about 35° C to about 110° C. Finally, Claim 36 recites that there is no intermediate treatment of the pulp between the chlorine dioxide stage and the peroxide stage other than an optional wash.

Lastly, Claim 46 quite specifically claims a process for bleaching a kraft pulp in either a $D_OE_{O+P}D_1P$, $D_OE_PD_1P$, or $D_O/C\ E_PD_1P$ bleaching sequence with an optional washing step between the D_1 and P stages of each wherein a chelating agent is added during the D_1 stage and/or during the optional wash between the D_1 and P stages in an amount and under conditions which are sufficient to produce a bleached pulp having substantially improved brightness, viscosity and yield as compared to pulp bleached using the same sequences without the chelating agent addition.

As for the dependent claims, Claim 11 specifies that the pulp to be bleached in Claim 1 is an oxygen delignified pulp and thus significantly narrows the scope of Claim 1.

Claim 15 and 33 depend immediately from Claims 14 and 32 and depend ultimately from Claims 1 and 19. Claims 15 and 33 which each require that the pulp is treated with the chelating agent during both the first chlorine dioxide stage and during the second chlorine dioxide stage. Claims 16 and 17 depend from Claim 15 and also incorporate

its limitations. Likewise, Claims 34 and 35 depend from Claim 33 and include its limitations.

Claim 45 limits Claim 36 by requiring treating the pulp with an amount of chelating agent during the first chlorine-dioxide bleaching stage.

In Claim 30, Claim 19 is narrowed by the further limitation of treating the pulp with the chelating agent during the initial bleaching stage.

Finally, Claims 47 limits Claim 46 in that it requires that the chelating agent is added during the D_0 and D_1 stages.

Thus, at least Claims 11, 15 - 17, 30, 33 - 35, 45, and 47 are separately and independently patentable over the independent claims and do not stand or fall together with the independent claims.

VIII. Argument

A. Summary

The Examiner's obviousness rejections of all of the pending claims in the present application are errorneous and contrary to law and should be reversed. The Appellant's invention relates to novel bleaching process for papermaking pulps. According to Appellant's process, the pulp is first treated in a chlorine-containing bleaching stage such as a chlorine dioxide bleaching stage. Thereafter, the pulp may be treated in an alkaline extraction stage. Next, the pulp is treated in an additional chlorine dioxide stage and finally in a peroxide bleaching stage.

An important aspect of the invention is the use of a metal chelating agent prior to the final peroxide bleaching stage, either during the immediately preceding chlorine dioxide stage or during an optional wash of the pulp carried out in between the chlorine dioxide stage and the final peroxide stage. This chelating agent is preferably an aminopolycarboxylic acid or an aminopolyphosponic acid or an alkaline metal salt thereof and is added at an acidic pH of from about 1 to about 6. More preferably, the pH ranges from about 3 to about 6.

The inventive bleaching process has been observed to provide surprising and unexpected improvements in pulp brightness and viscosity, two important properties of a

papermaking pulp which are generally considered as being in opposition to one another, i.e., an improvement in one property has in the past generally required a tradeoff in the other property.

The Examiner cites an array of references in an effort to "cut and paste" together all of the features of Appellant's claimed invention. The Examiner's primary reference is European Patent Application EP 622,491. This reference clearly does not by itself anticipate or render obvious the claimed invention as it teaches only the use of a single chlorine dioxide stage prior to a peroxide stage.

Among the supporting references cited by the Examiner in an attempt to fill in the gaps in the EP 622,491 reference are the Devenyns article and PCT Application WO 95/27,100. However, the Appellant has clearly shown through a declaration under Rule 131 and its supporting evidence that Appellant's invention predates these two references and hence the references are not citable as prior art. Accordingly, to the extent the Examiner's rejections rely on these references, they are unsustainable and should be reversed.

In addition, the Examiner has not even attempted to establish a motivation to combine the numerous references he has cobbled together in his rejections. The law clearly requires a motivation in the art to combine even two references and certainly larger combinations of references, such as in the present case, should require an even clearer showing of motivation to combine the references as proposed by the Examiner. Since such a motivation to combine the references is entirely lacking in the Examiner's rejections, the rejections are clearly contrary to law and should be reversed on this ground as well.

Further still, "if" they could be combined, the references cited by the Examiner would not lead one of skill in the art to the claimed invention. The clear suggestion in the supporting references cited by the Examiner is that sequences of multiple chlorine dioxide stages with extraction stages therebetween should be employed at the end of the bleaching sequence and not at its start as in the claimed invention. Since, the supporting references in effect teach away from the claimed invention and do not support a conclusion of obviousness, the Examiner has failed to establish a prima facie case of obviousness and so the rejections should again be reversed.

Lastly, even if the Examiner had established a prima facie case of obviousness,

the surprising and unexpected improvements found in both pulp viscosity and brightness in the claimed invention clearly overcome any presumption of obviousness and demonstrate the nonobvious nature of the claimed invention.

Accordingly, the Examiner's rejections in this case are not well-founded. It is respectfully requested that they be reversed, and that Appellant be allowed to have his patent at the earliest possible convenience.

B. Prior art rejections

1. The References

European Patent Application EP 622,491 ("EP 622,491") entitled "Method for bleaching lignocellulose-containing pulp" describes a method for bleaching lignocellulose-containing pulp with a peroxide-containing compound, in which the pulp is subjected to acid treatment and treated with a complexing agent. After the acid treatment, a magnesium compound and a calcium compound are added to the pulp whereupon the pulp is bleached at a pH of from about 7 to about 13 with the peroxide-containing compound. See EP 622,491, page 2, lines 43 - 48. The reference states that the acid treatment may be carried out in the presence of a delignifying chemical such as ozone, acid hydrogen peroxide, per-acid and salts thereof, chlorine dioxide, and chlorine. See page 4, lines 51 - 56. EP 622,491 also states that after the acid treatment and the subsequent peroxide bleaching, the pulp may thereafter be further bleached in one or more additional bleaching stages such as an ozone stage, a chlorine dioxide stage, or an alkaline extraction stage. See page 5, lines 40 - 44.

Importantly, however, the reference does not disclose or suggest the use of any additional bleaching stages prior to the acidic complexing agent treatment and the peroxide bleaching stage.

The printed publication "Optimal Use of Hydrogen Peroxide to Design Low AOX ECF Sequences" by Devenyns et al. ("Devenyns") describes various potential modifications of a conventional five stage DEDED bleaching sequence by employing peroxide in order to reduce AOX discharge from the paper mill.

U.S. Patent No. 4,568,420 to Nonni ("Nonni") describes a multi-stage bleaching sequence wherein an alkaline extraction stage (E) is enhanced by addition of oxygen and either a hypochlorite or a peroxide in the extraction stage. However, Nonni does not disclose or suggest the use of such an enhanced extraction stage following an initial chlorine containing stage such as a chlorine dioxide stage and prior to a chlorine dioxide stage (including a chelating agent) and a final peroxide bleaching stage.

The printed publication "Integration of D and EDTA Stages During Hardwood and Softwood Pulp Bleaching" by Sergeyev et al. ("Sergeyev") describes the combined treatment of pulp with a chelating agent and chlorine dioxide prior to a peroxide stage. However, Sergeyev fails to disclose or suggest the use of this bleaching treatment following an initial chlorine containing stage and an extraction stage such as in a D_oEDP sequence wherein a chelating agent is applied to the pulp during the chlorine dioxide (D) stage.

The textbook "The Bleaching of Pulp" by Singh ("Singh"), at pages 126 - 127, describes different bleaching sequences which have been used in the past employing, as a part of the sequence, multiple chlorine dioxide stages with an extraction stage in between ("DED"). Singh states that such bleaching treatment known was a DEDH bleaching sequence, wherein "H" represents a hypochlorite treatment. Singh states that other sequences which have been used in the past include CEDED, DEDED, D/CEDED, CHDED, CEDPD[3], $C^E/_HDED$ CEHDED, CHEDED, CEHCHDED, and CEDEDED. Importantly, in each of these sequences, the common "DED" portion of the bleaching treatment occurs last in the bleaching sequence.

U.S. Patent No. 4,946,556 to Prough ("Prough") describes a pulp bleaching process wherein the pulp is treated in at least two consecutive oxygen delignification stages and is also treated with a chelating agent during a wash between the two oxygen delignification stages. However, Prough does not disclose or suggest the use of a chelating agent in connection with a chlorine dioxide stage prior to a peroxide bleaching stage.

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[3]Singh states that in this instance, the peroxide stage is in fact a "kind of caustic soda extraction" given the operating pH and temperature.

PCT International Application WO 95/27100 ("WO 95/27100") entitled "Method for Complex Treatment of Pulp in Conjunction with a Chlorine Dioxide Stage" describes pulp bleaching processes wherein a pulp is first treated in an oxygen stage ("O"), then in a chlorine dioxide stage ("D"), and thereafter in an non-chlorine-containing stage such as an oxygen stage, a peroxide stage or an ozone stage. According to the reference, a complexing agent is added to the cellulose pulp in conjunction with the chlorine dioxide bleaching step. However, the reference does not disclose or suggest the use of a first chlorine containing stage, then an extraction stage, followed by a further chlorine dioxide stage (with a metal chelating agent treatment) and a final peroxide bleaching stage.

2. The Rejections

The Examiner contends that Claims 1 - 7, 10, 11, 13 - 17, 19- 26, 31, 32, 36, 37, 39 -42, 44, and 46 are all obvious in view of the EP 622,491 reference in view of either Devenyns or Nonni or Sergeyev "with or without" Singh. The Examiner contends that EP 622,491 discloses a chlorine dioxide bleaching stage followed by a final peroxide bleaching stage wherein a chelating agent is use to treat the pulp in the chlorine dioxide bleaching stage. According to the Examiner, Devenyns, Nonni, and Singh each disclose bleaching sequences having, as a part of the sequence, a chlorine dioxide stage (D) followed by an extraction stage (E), followed by an additional chlorine dioxide stage (D). Allegedly, it would have been obvious, in view of one or more of these references, to replace the D stage of EP 622,491 with a three stage DED sequence to create an overall DEDP bleaching sequence. Sergeyev is also alleged to render obvious the use of oxygen and or peroxide in an alkaline extraction stage which is recited in certain of the aforementioned claims.

In addition, the Examiner contends that Claim 48 is obvious over the aforementioned art combination and in further view of Prough. The Examiner alleges that in view of Prough it would have been obvious to add a chelating agent to the pulp during a pulp wash stage.

Finally, claims 30, 33 - 35, 45, and 47 are alleged to be obvious over EP 622,491 in view of either Devenyns or Nonni with or without Singh and in further view of WO 95/27100. The Examiner contends that the PCT application would render it obvious to

include a chelating agent to both the first and second chlorine dioxide stages of Devenyns.

3. Standards for Nonobviousness

Claims drafted to specifically point out and distinctly claim Appellants' invention have been rejected by the Examiner as obvious from the combined disclosures of the above references. In reviewing the art rejection, this Board should first look at the references independently of what the Examiner has said and without regard to Appellants' claimed invention, and should reach its own conclusion as to whether they are obviously combinable and whether they fairly teach or suggest a process according to Appellants' invention, since obviousness is a legal conclusion, the determination of which is a question of patent law. In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA, 1963); In re Carleton, 599 F.2d 1021, 202 USPQ 165 (CCPA 1979).

In this regard, its should be kept in mind the fact that the burden is on the Examiner to establish obviousness by competent evidence.

> In order to establish a prima facie case of obviousness, it is necessary for the examiner to present evidence, preferably in the form of some teaching, suggestion, incentive or inference in the applied prior art, or in the form of generally available knowledge, that one having ordinary skill in the art would have been led to combine the relevant teachings of the applied references in the proposed manner to arrive at the claimed invention.

Ex parte Levengood, 28 USPQ2d 1300, 1301 (Bd. Pat. App. & Int., 1985) (Citing Canella v. Starlight Archery, 804 F2d 1335, 231 USPQ 644 (Fed. Cir. 1986) and Ashland Oil Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985).

The teachings of the prior art must be considered without regard to the invention to see what they fairly suggest to the person of ordinary skill at the time the invention was made. The mere fact that a person of ordinary skill could modify the references to make them fit together to produce the invention does not make the invention obvious.

> Obviousness under 35 USC 103 is not what a routineer could have done but what it would have "been obvious" for such a person to do.

Ex Parte Marinaccio, 10 USPQ 2d 1716, 1717 (Board of Patent Appeals 1989). See also, In Re Gordon, 733 F.2d 900, 221 USPQ 1125, 1127 (CAFC 1984).

Furthermore, the art must be viewed without regard to what the application teaches.

> In other words, to imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

W. L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1550, 220 USPQ 303, 312-3 (Fed. Cir. 1983).

The courts have made it abundantly clear that considerations of patentability (from an obviousness standpoint) must be totally objective, and that the decision maker must avoid the use of hindsight when viewing the references for what they teach.

> One cannot use hindsight to pick and choose among isolated disclosures in the prior art to depreciate the claimed invention.

In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).

As will be shown, the rejection in this case contravenes these principles because it is not based on what the references fairly teach or suggest, but instead is based on a hindsight reconstruction of the references which could only have been achieved with the knowledge of Appellants' teachings.

4. The Prior Art Rejection Should be Reversed

a. EP 622,491 Does Not Describe or Suggest the Claimed Sequence.

The Examiner takes EP 622,491 as his primary reference in each of his obviousness rejections. Therefore, it is appropriate to set out, as an initial matter, the

differences between this reference and the claimed invention, i.e., the "gaps" which the Examiner must fill in from the supporting references.

As discussed above, according to the present invention, wood pulp is bleached in two chlorine dioxide stages (D) with an intermittent extraction stage (E), all carried out prior to being bleached in a final peroxide stage (P). In at least the second D stage (and preferably in the first D stage as well), the pulp is treated with a chelating agent to adjust the metals profile of the pulp prior to the peroxide bleaching. Thus the invention employs bleaching sequences such as $D_OE_{O+P}D_1P$, $D_OE_PD_1P$, and $D_O/C\ E_PD_1P$ with a chelating agent in at least the D_1 stage.

No such bleaching sequence is taught in EP 622,491. The reference only describes the use of a single D stage prior to peroxide bleaching. EP 622,491 teaches that this single stage is ideal, since by using only a single stage of chlorine dioxide the amount of chlorinated effluents can be kept to a minimum. In particular, the '491 application notes:

> It is possible to bleach the pulp to full brightness with an initial chlorine dioxide stage followed by a peroxide stage and still reducing the produced and discharged amount of chlorine containing compounds to an extremely low level.

See Page 4, line 57 - page 5, line 1, emphasis added.

Clearly EP 622,491 provides no incentive to employ two D stages in an initial DED series of stages prior to peroxide bleaching. Further, to the extent the reference suggests any additional use of chlorine dioxide, it suggests using more chlorine dioxide after a peroxide stage, not before. The application states:

> After the pretreatment stages and the subsequent bleaching with a peroxide-containing compound, the pulp may be used as such for making paper. If so desired, the pulp may also be finally bleached to a higher brightness in one or more stages, e.g. by means of hydrogen peroxide, ozone, sodium dithionite or chlorine dioxide. Final bleaching can also include alkaline extraction stages which may be fortified by peroxide and / or oxygen.

See Page 5, lines 40 - 44, emphasis added.

Thus, at a minimum, the Examiner must show from the supporting references a basis to modify the DP bleaching sequence of EP 622,491 to a sequence employing a first

chlorine containing stage, an intermittent extraction stage, a following chlorine dioxide stage and a final peroxide stage.

b. The Claimed Invention Predates Devenyns and PCT Application WO 95/27100

Appellant's invention predates two of the Examiner's supporting references, Devenyns and WO 95/27100 and thus the references may not be cited as prior art. Pursuant to 37 CFR 1.131, Appellant has submitted a declaration of the inventor, Dr. Ted Tsai, which clearly demonstrates reduction to practice of his invention before the effective date of either Devenyns or the WO 95/27100 reference.

The Devenyns article was apparently published in connection with a 1995 TAPPI Pulping Conference and is marked as being published in October of 1995. The WO 95/27100 application has an international publication date of October 12, 1995. Thus, both references may be removed by demonstration of reduction to practice of the claimed invention prior to October 1, 1995.

A brief review shows that each of the independent claims (1, 19, 36, 48) encompasses a DEDP bleaching sequence wherein a chelating agent (Q) is added in at least the second D stage and wherein the extraction stage (E) may be reinforced with peroxide and / or oxygen. The Record of Invention (ROI) attached to Dr. Tsai's declaration clearly shows reduction to practice of this basic technology, and as the declaration attests the ROI was completed and submitted to the assignee well before October 1, 1995. The experiments described therein were conducted earlier still.

Turning now to specific portions of the ROI, at page 2 in his "Technical Findings", Dr. Tsai determined that chelating agents (CA) may both boost pulp brightness and prevent viscosity loss, especially in bleaching sequences wherein a peroxide (P) stage follows a chlorine dioxide stage. In Technical Finding 6, Dr. Tsai determined that addition of the

chelating agent in the D_1 stage[4] was preferred and more efficient than chelating agent addition in other stages.

Table 1 of the ROI summarizes the results of a group of experiments wherein a chelating agent was added to the "D" or "D1" stage of a $D_oE_{o+p}DP$ bleaching sequence. These experiments show improvement in both final pulp brightness and viscosity compared to a control sample wherein no chelating agent was added. For example, in the control (Sample No. 1), the final brightness was 86.3 and the final viscosity was 15.7 cP. However, when 0.4 EDTA chelating agent was added in Sample No. 2, brightness improved to 88.7 and viscosity improved 24.2 percent to 19.5 cP.

In Table 2, further experiments are documented showing the improved performance of a $D_oE_{o+p}DP$ bleaching sequence when a chelating agent is added to the D stage. Again, in comparing Samples 11 (control) and 12, a dramatic improvement in viscosity is seen. Likewise, Table 4 shows still further examples of reduction to practice of the claimed subject matter.

While the use of peroxide in pulp bleaching is known, it is also a well-documented drawback of peroxide that it adversely affects pulp strength (more so in many instances than other agents). This believed to be due to peroxide's reduced selectivity and resultant greater tendency to attack on the desirable cellulose constituent of pulp during the bleaching process. And while peroxide offers promise as a terminal stage of a bleach sequence (due to its bleaching effect on prior-bleached pulp), the aggressive nature of peroxide's attack on the cellulose itself is even more pronounced when the pulp has already been rid of much of its lignin content. The present invention addresses these problem enabling use of peroxide near the end of a bleach sequence without the dramatic loss in viscosity that would normally be expected when peroxide is applied to already-bleached pulp.

In view of these results in the ROI, there can be no doubt that Dr. Tsai reduced his invention to practice prior to October 1, 1995. Moreover, all of Dr. Tsai's work was completed in the U.S. at the research center of the assignee in New York. The ROI is clearly

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[4]In his experimental notes, Dr. Tsai refers to an initial chlorine dioxide stage as a "D_o" stage. The second chlorine dioxide stage then becomes a "D1" stage and so forth.

addressed as originating from Tuxedo, New York. Hence, the claimed invention was reduced to practice in the United States prior to the effective dates of the Devenyns and WO 95/27100 references, and the references should therefore be removed as prior art.

c. <u>There is no Motivation or Suggestion to Combine the Supporting References with EP 622,491 As Proposed by the Examiner</u>.

Recognizing the above defects in EP 622,491 taken alone, the Examiner also sites a series of supporting references to fill in the gaps in the EP 622,491 reference. In particular, these references are cited for the supposed proposition that a DED series of stages preceding a peroxide stage is a known substitute for a single D stage, and that it would therefore have been obvious to substitute a DED series of stages for the initial D stage of EP 622,491. However, the Examiner has provided no suitable motivation or suggestion to combine the supporting references with the primary EP622,491 reference. Indeed, the Examiner has not even attempted to articulate a motivation to combine the references in the manner proposed in his rejections.

The mere existence, in isolation, of various components of Appellant's inventive bleach sequence scattered somewhere among a collection of prior art references cannot render the sequence obvious or even prima facie obvious. While bleaching is typically accomplished in a sequence of "stages", these stages are not self-contained, totally independent "modules" which can be interchanged as desired like tinker toys to always accomplish the same or some "obvious" and predictable result. To achieve the desired final bleached pulp, the number and sequence of the stages must be designed in such a way that the product of each stage provides a suitable starting material for the next stage, which may be advantageously further processed in the subsequent stage. A bleaching sequence is not obvious simply because each of its constituent stages is known somewhere in the prior art.

Consistent with this reasoning, numerous decisions of the Federal Circuit, have made it abundantly clear that to establish a prime facie case of obviousness, the Examiner <u>must</u> be able to point to some clear suggestion in the art that would have led one of

skill to combine the references so as to arrive at the claimed invention.

Should there have been any doubt, the Federal Circuit very recently spoke at length on this point in deciding In re Lee, 61 USPQ2d 1430 (Fed. Cir. 2002). Lee involved the appeal of an Examiner's rejection of an applicant's claim based on a combination of two references. Without pointing to any specific motivation in the art to combine the two references, the Examiner stated that combining the references would have been obvious because one of the disclosures was "just a programmable feature which can be used in many different device[s]" and because the result would be "user friendly" and function "as a tutorial." See Lee, 61 USPQ2d at 1432. The Appeal Board affirmed the examiner stating that "the conclusion of obviousness may be made from common knowledge and common sense of a person of ordinary skill in the art without any specific hint or suggestion in a particular reference." See Id.

The Federal Circuit reversed the rejections. The court stated that the Examiner's "conclusory statements ... do not adequately address the issue of motivation to combine. This factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority." See Lee, 61 USPQ2d at 1434 (emphasis added). The court also found fault with reliance on "basic knowledge" or "common sense". Neither was a suitable substitute for authority when the law requires authority. See Lee, 61 USPQ2d at 1435.

The rejection in the present case is on par with that seen in Lee. The Examiner has pointed to no teaching whatsoever in the prior art to provide a motivation to combine the cited references so as to arrive at the claimed invention. In reality, the Examiner's rejections amount to nothing more than a thinly veiled disguise of his attempt to reconstruct Appellant's invention in hindsight using the invention itself as a template, i.e., to use "that which the inventor taught against its teacher." See W.L. Gore v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312 - 313 (Fed. Cir. 1983). This is clearly contrary to law, and hence the Examiner's rejections must fail from the outset for lack of motivation to combine the references.

d. If Combined With EP 622,491, the Supporting References Suggest Use of a DED Series of Stages After the Peroxide Stage, Not Before.

As noted above, the EP 622,491 reference employs a single chlorine dioxide or "D" stage prior to its peroxide stage. In an attempt to overcome this, the Examiner cites to supporting references which are alleged to "teach" that a three stage chlorine dioxide, extraction, chlorine dioxide sequence (DED) is interchangeable with a single D stage. However, while the supporting references may describe bleaching processes employing the stages of DED somewhere in a bleach sequence, they do not provide a "generic" teaching that series of stages "DED" may be universally substituted for a single D stage. The supporting references only describe very specific bleaching processes in which a DED series of stages may have been used. None of these processes include the claimed invention.

Nonni, for instance, is directed to use of an extraction stage which may also include oxygen and hydrogen peroxide. This "E_{op}" stage is the only use of peroxide described in Nonni and the only stage even remotely similar to a P stage. Nonni teaches that after completion of this stage, the pulp may be further bleached in any of a variety of sequences, including D, DED, (hD), HD, HDED or (hD)ED. Col. 4, lines 33 - 41. Thus, to the extent Nonni may be combined with the '491 application, this combination would only have led one of skill in the art to employ a further series of bleaching stages such as DED after the P stage described in the '491 application. This is, of course, contrary to Appellant's invention.

The Devenyns publication, as discussed above, is not properly citable as prior art. However, even if it could be considered as prior art, Devenyns also fails to suggest substitution of a DED series of stages for a single D stage as claimed in the invention.

Likewise, the portions of the Singh textbook cited by the Examiner are directed to the use of a DED series of stages at the conclusion of pulp bleaching. The large

list of sequences on page 127 (namely CEDED, DEDED, D/CEDED, CHDED, CEDPD[5], $C^{E}/_{H}$DED CEHDED, CHEDED, CEHCHDED, and CEDEDED) all include DED stages in the terminal portion of a bleaching sequence. Also, importantly, Singh never hints or suggests that there is an equivalence or interchangeability between a D stage and a DED sequence.

Thus, it may be seen that the cited supporting references are wholly inadequate to support the supposed proposition that a D stage and a DED sequence are interchangeable or equivalent. Moreover, to the extent the references could be taken to provide a suggestion to use a DED series of stages in all bleach sequences that could possibly be imaged (which they plainly do not), they would lead one of skill in the art to employ this sequence after a peroxide (P) stage, not before it. Hence, they would in effect teach away from the claimed invention.

Accordingly, the combination of these teachings with the '491 application is simply insufficient to direct or lead one of ordinary skill in the art to the claimed invention without the use of hindsight and the use of Appellants' invention as a template.
Therefore, it is submitted that the Examiner has failed to establish a prime facie case of obviousness and that the rejections should be overturned.

e. <u>The Surprising Bleaching Results Obtained by the Claimed Bleaching Process Overcome Any Possible Prime Facie Case of Obviousness</u>.

As the Appellant has stressed previously, the claimed invention is not prima facie obvious in view of the cited art combination because there is no motivation to combine the art in the manner proposed by the Examiner. And even if the art was combined, the combination would still fail to provide all the limitations of the claimed invention as just

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[5]Singh states that in this instance, the peroxide stage is in fact a "kind of caustic soda extraction" given the operating pH and temperature.

discussed above. However, even if a prima facie case of obviousness had been made by the Examiner, Appellant's experiments show surprising and unexpected improvements over the prior art which more than offset any alleged prima facie obviousness. Numerous examples throughout the specification show surprising improvements in pulp brightness and / or viscosity as compared to a hypothetical DEDP bleaching sequence without the addition of any chelating agent. The following examples are illustrative of the improvements seen:

In Samples 1 and 2 (Found in Table 1), two $D_oE_{o+p}DP$ bleaching sequences were compared, one with no chelating agent and one with a chelating agent in the D stage. The observed brightness increased 2.4 points while at the same time the viscosity increased 3.8 cP when a chelating agent was employed in the D stage. This is highly surprising and unexpected as one of skill in the art would ordinarily expect that improvements in brightness would come at the expense of a reduction or "tradeoff" in pulp viscosity.

Similarly, in Table 7, Samples 46 and 47 show the dramatic improvement in the bleaching of a hardwood pulp when 0.5% EDTA chelating agent is added in the D stage of a $D_oE_{o+p}DP$ bleaching sequence. As compared to the control sample, brightness improved over 9 points and at the same time, the pulp viscosity improved from 9.2 cP to 13.1 cP. This is over a 42% increase in final pulp viscosity. No prior art cited by the Examiner even hints at such results, which are truly profound and unexpected given that they arise in conjunction with a terminal peroxide stage previously known to adversely affect pulp strength (i.e., reduced viscosity).

Further still, in Table 9, a comparison of Samples 57 and 59 show the dramatic improvement in pulp viscosity when a chelating agent is added to the D stage of a $D_oE_{o+p}DP$ bleaching sequence. While only a slight increase in brightness was observed, pulp viscosity increased 43.5 percent from 16.8 cP to 24.1 cP.

Such dramatic improvements in final pulp properties show that the claimed invention is in no way obvious in view of the prior art. Thus, even if the invention were prima facie obvious, these results completely rebut and overcome any hint of obviousness.

5. Claims 11, 15 - 17, 30, 33 - 35, 45, and 47 Separately Distinguish Over the Cited References

The above arguments, while generally applicable to all of the rejections of the pending claims, have principally been directed to the Examiner's rejection of Claim 1. However, Claims 11, 15 - 17 , 30, 33 - 35, 45, and 47 are independently and separately distinguishable over the cited references for the reasons set forth herein.

Claim 11 specifies that the pulp to be bleached in Claim 1 is an oxygen delignified pulp. While again the bleaching sequence of Claim 1 is not itself disclosed or suggested in the cited references, it is even more clear that there is not even a hint of a suggestion to carry this specific bleaching process out upon an oxygen delignified pulp as required by Claim 11.

The Examiner fails to specifically address how the cited references render this claim obvious. The Examiner's only comment even remotely addressed to Claim 11 is his comment that "NONNI teaches the alternativeness of bleaching oxygen-delignified pulp with D or DED". He makes no attempt to explain how this is applicable to the bleaching sequence claimed in Claim 1 as Nonni of course is not directed to the claimed bleaching sequence.

As discussed above with respect to the overall bleaching sequence, while different types of pulp bleaching treatments are know, such as oxygen delignification, these various treatments cannot simply be plugged together in random fashion with any expectation that the overall bleaching sequence will be beneficial and an improvement over the art. Because there is no motivation in the art to combine the further treatment of an oxygen delignfied pulp in Nonni with a bleaching sequence even remotely like that claimed by Appellant, the rejection of Claim 11 is erroneous and should be reversed.

Turning now to Claims 15 (and its dependent Claims 16 and 17), 30, 33 (and its dependent Claims 34 and 35), 45 and 47, each of these claims requires the use of a chelating agent in both the initial chlorination stage and in the later chlorine dioxide stage. The two references which the Examiner argues would have made this limitation obvious are the Sergeyev et al. article and PCT Application WO 95/27,100.

Again, however, Appellant's invention predates WO 95/27,100 and the application is not prior art to the present appliction. Therefore, any rejection relying on this

reference is improper and should be reversed.

Further, as with all his other rejections, the Examiner has failed to establish a motivation or suggestion in the art to combine either WO 95/27,100 or Sergeyev with the remaining references to render the claims obvious. Simply because a reference might describe multiple chelating treatments in one bleaching sequence does not imply that this is desirable or practical in another bleaching treatment. Without any suggestion from the art, the references cannot be combined as proposed by the Examiner and hence the rejection should be reversed.

IX. Conclusion

Appellants have clearly demonstrated that, contrary to the Examiner's contentions, the claimed invention is neither taught nor in any way suggested by the combination of references which are contended by the Examiner to render the same obvious.

Therefore it is submitted that all of the Examiner's rejections are contrary to law and erroneous, and reversal of the same is respectfully requested.

Respectfully submitted,

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on 10/31/02
Date

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Appendix of Claims

The claims involved in this appeal read as follows:

Claim 1. A method for bleaching a digested kraft pulp containing lignocellulosic fibers with one or more chlorine containing compounds which comprises treating the pulp at a pH within the range of from about 1 to about 6 with a chelating agent during a second chlorine dioxide bleach stage following a first chlorine dioxide-containing bleach stage and, thereafter, as the next and final bleaching stage after the second chlorine dioxide bleach stage, treating the pulp with a peroxide bleach agent, whereby the peroxide-treated pulp exhibits a substantial improvement in viscosity retention and brightness over the same pulp in the absence of treatment with the chelating agent during the second chlorine dioxide bleach stage.

Claim 2. The method of Claim 1 wherein the consistency of the pulp during bleaching is maintained within the range of from about 0.5% to about 40% by weight.

Claim 3. The method of Claim 1 wherein the amount of chelating agent ranges from about 0.01 wt. % to about 1.0 wt. % based on the dry weight of pulp being contacted.

Claim 4. The method of Claim 1 wherein the chelating agent is selected from the group consisting of aminopolycarboxylic acids and aminopolyphosponic acids and the alkaline metal salts thereof.

Claim 5. The method of Claim 4 wherein the chelating agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), nitrilotriacetic acid (NTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepenta (methylenephosphonic) acid (DTPMA) and the alkali or alkaline earth salts thereof.

Claim 6. The method of Claim 1 wherein the pulp has a pH in the range of from about 3 to about 6 and is maintained at a temperature in the range of

from about 35°C to about 90°C during the treatment with the chelating agent.

Claim 7. The method of Claim 1 wherein the treatment with the chelating agent is conducted for from about 30 seconds to about 3 hours.

Claim 8. Cancelled.

Claim 9. Cancelled.

Claim 10 The method of Claim 1 further comprising contacting the pulp with one or more peroxide stabilizers during treatment with the peroxide bleach agent.

Claim 11. The method of Claim 1 wherein the pulp to be bleached is an oxygen delignified pulp.

Claim 12. Cancelled.

Claim 13. The method of Claim 1 wherein the bleaching operation comprises an initial chlorination stage, an extraction stage, and a peroxide stage.

Claim 14. The method of Claim 1 wherein the bleaching operation comprises an initial chlorination stage, an extraction stage, a chlorine dioxide bleaching stage, and a peroxide stage.

Claim 15. The method of Claim 14 wherein the pulp is treated with the chelating agent during both the first chlorine dioxide stage and during the second chlorine dioxide stage.

Claim 16. The method of Claim 15 further comprising contacting the pulp with one or more peroxide stabilizers.

Claim 17. the method of Claim 16 wherein the peroxide stabilizers are selected from the group consisting of magnesium sulfate and sodium silicate.

Claim 18. Cancelled.

Claim 19. A process for bleaching a pulp containing lignocellulosic fibers comprising:

bleaching the pulp with a chlorine-containing compound in an initial bleaching stage;

treating the pulp in an extraction stage following the initial bleaching

stage wherein the extraction stage contains oxygen and/or peroxide;

thereafter treating the pulp during a chlorine dioxide bleaching stage or during an optional wash carried out immediately after the chlorine dioxide bleaching stage, at a pH within the range of from about 1 to about 6, with from about 0.01 wt.% to about 1 wt. % chelating agent, based on the dry weight of fibers in the pulp, for a period of time sufficient to substantially improve the brightness of the pulp; and

treating the pulp with a peroxide bleach agent in a final bleaching stage subsequent to the chlorine dioxide bleaching stage.

Claim 20. The process of Claim 19 wherein the amount of chelating agent ranges from about 0.03 wt. % to about 0.5 wt. % based on the dry weight of pulp.

Claim 21. The process of Claim 19 wherein the chlorine compound is selected from the group consisting of chlorine dioxide, chlorine gas, and a mixture of chlorine dioxide and chlorine gas.

Claim 22. The process of Claim 19 further comprising treating the pulp with the chelating agent at one or more points during the chlorine dioxide bleaching stage.

Claim 23. The process of Claim 19 wherein the chelating agent is selected from the group consisting of aminopolycarboxylic acids and aminopolyphosponic acids and the alkaline metal salts thereof.

Claim 24. The process of Claim 23 wherein the chelating agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), nitrilotriacetic acid (NTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepenta (methylenephosphonic) acid (DTPMA) and the alkali or alkaline earth salts thereof.

Claim 25. The process of Claim 19 wherein the pulp has a pH in the range of from about 3 to about 6 and is maintained at a temperature in the range of from about 35°C to about 90°C during the treatment with the chelating agent.

Claim 26. The process of Claim 19 wherein the treating step with the chelating agent is conducted for from about 30 seconds to about 3 hours.

Claim 27. Cancelled.

Claim 28. Cancelled.

Claim 29 The process of Claim 19 further comprising contacting the pulp with one or more peroxide stabilizers during treatment of the pulp with the peroxide bleach agent.

Claim 30. The process of Claim 19 further comprising treating the pulp with the chelating agent during the initial bleaching stage.

Claim 31. The process of Claim 19 wherein the pulp is bleached in a bleaching operation comprising an initial chlorination step, an extraction step, and a peroxide step.

Claim 32. The process of Claim 19 wherein the pulp is bleached in a bleaching operation comprising an initial chlorination step, an extraction step, a chlorine dioxide bleaching step, and a peroxide step.

Claim 33. The process of Claim 32 wherein the pulp is treated with the chelating agent during both the initial chlorine-containing bleaching stage and during the chlorine dioxide stage.

Claim 34. The process of Claim 33 further comprising contacting the pulp with one or more peroxide stabilizers.

Claim 35. The process of Claim 34 wherein the peroxide stabilizers are selected from the group consisting of magnesium sulfate and sodium silicate.

Claim 36. A process for bleaching a digested kraft pulp containing lignocellulosic fibers with chlorine and non-chlorine-containing bleaching agents, wherein the pulp has a consistency in the range of from about 0.5% to about 40% , the process comprising:

bleaching the pulp with chlorine dioxide in a first bleach stage;

treating the pulp in an extraction stage following the first bleach stage wherein the extraction stage contains oxygen and/or peroxide;

treating the pulp during a second chlorine dioxide bleach stage following the extraction stage with a metal chelating agent at a pulp pH ranging from about 1 to about 6, wherein the amount of chelating agent is sufficient to substantially

reduce an organic halide content of the bleached pulp and wherein the temperature of the pulp during the treating is within the range of from about 35° to about 110°C; and

bleaching the pulp with a peroxide bleach agent in a bleach stage after the second chlorine dioxide bleach stage without any intermediate treatment between the peroxide stage and the second chlorine dioxide stage other than an optional wash.

Claim 37. The process of Claim 36 wherein the amount of chelating agent ranges from about 0.03 wt. % to about 0.5 wt. % based on the dry weight of pulp.

Claim 38. Cancelled.

Claim 39. The process of Claim 36 wherein the chelating agent is selected from the group consisting of aminopolycarboxylic acids and aminopolyphosponic acids and the alkaline metal salts thereof.

Claim 40. The process of Claim 39 wherein the chelating agent is selected from the group consisting of ethylenediaminetetraacetic acid (EDTA), diethylenetriaminepentaacetic acid (DTPA), nitrilotriacetic acid (NTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepenta (methylenephosphonic) acid (DTPMA) and the alkali or alkaline earth salts thereof.

Claim 41. The process of Claim 36 wherein the pulp has a pH in the range of from about 3 to about 6 and a temperature in the range of from about 35°C to about 90°C during the second chlorine dioxide bleach stage.

Claim 42. The process of Claim 36 wherein the second chlorine dioxide bleach stage is carried out for from about 30 seconds to about 3 hours.

Claim 43. Cancelled.

Claim 44. The process of Claim 36 further comprising contacting the pulp with one or more peroxide stabilizers during the bleaching stage employing peroxide.

Claim 45 The process of Claim 36 further comprising treating the pulp with an amount of chelating agent during the first chlorine-dioxide bleaching stage.

Claim 46. A process for bleaching kraft-digested pulp which comprises a sequence of bleach stages selected from the group consisting of

$D_OE_{O+P}D_1P$, $D_OE_PD_1P$ and $D_O/C\ E_PD_1P$ with an optional washing step between the D_1 and P stages of each wherein a chelating agent is added during the D_1 stage and/or during the optional wash between the D_1 and P stages in an amount and under conditions which are sufficient to produce a bleached pulp having substantially improved brightness, viscosity and yield as compared to pulp bleached using the same sequences without the chelating agent addition.

Claim 47. The process of Claim 46 wherein the chelating agent is added during the D_0 and D_1 stages.

Claim 48. The process of Claim 46 wherein the optional wash is employed and the pulp is treated with the chelating agent during the wash prior to treatment with the peroxide bleach agent.